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(54) **METHOD AND SYSTEM FOR AUTOMATING DATA QUERIES DURING DISCONTINUOUS COMMUNICATIONS**

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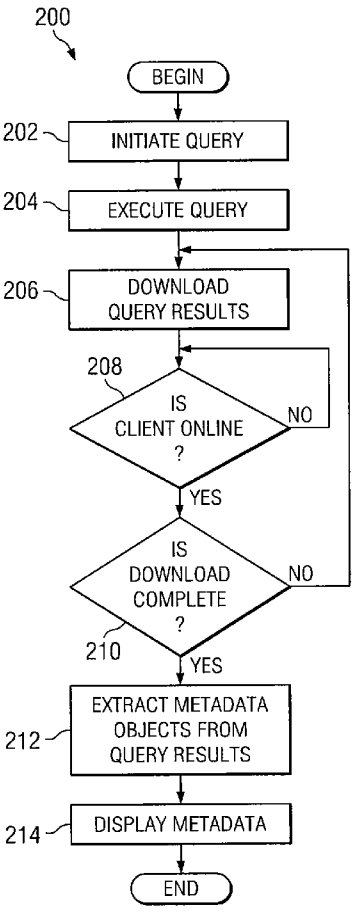
(57) **ABSTRACT**

In accordance with one embodiment, a method includes receiving a query request comprising geospatial filter criteria. The query request may be received from a mobile client computing system capable of displaying query results as overlays on a digital map. The digital map may be stored at the mobile client computing system and the query results may be stored at a server. First and second portions of the query results may be wirelessly transmitted from the server to the mobile client computing system. The first and second portions may be transmitted during first and second communication sessions between the mobile client computing system and the server. The first and second communication sessions may occur during respective time intervals temporally separated from each other by a gap interval. The client may be capable of concatenating the transmitted first and second portions of the query results.



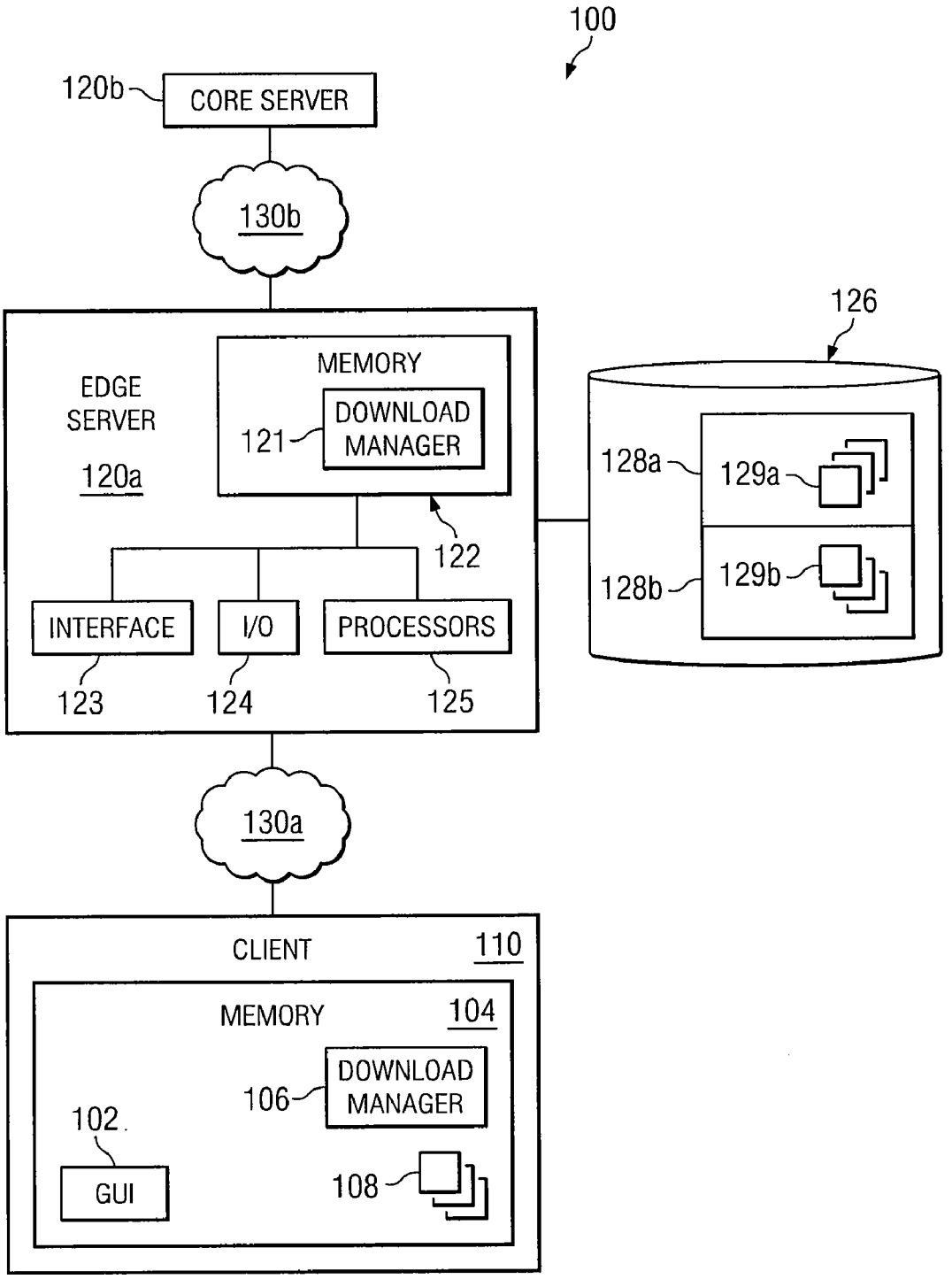

100
120b
CORE SERVER
130b
126
EDGE
SERVER
120a
MEMORY
121
DOWNLOAD
MANAGER
122
128a
129a
128b
129b
INTERFACE
I/O
PROCESSORS
123
124
125
130a
CLIENT
110
MEMORY
104
DOWNLOAD
MANAGER
106
102
GUI
108

FIG. 1

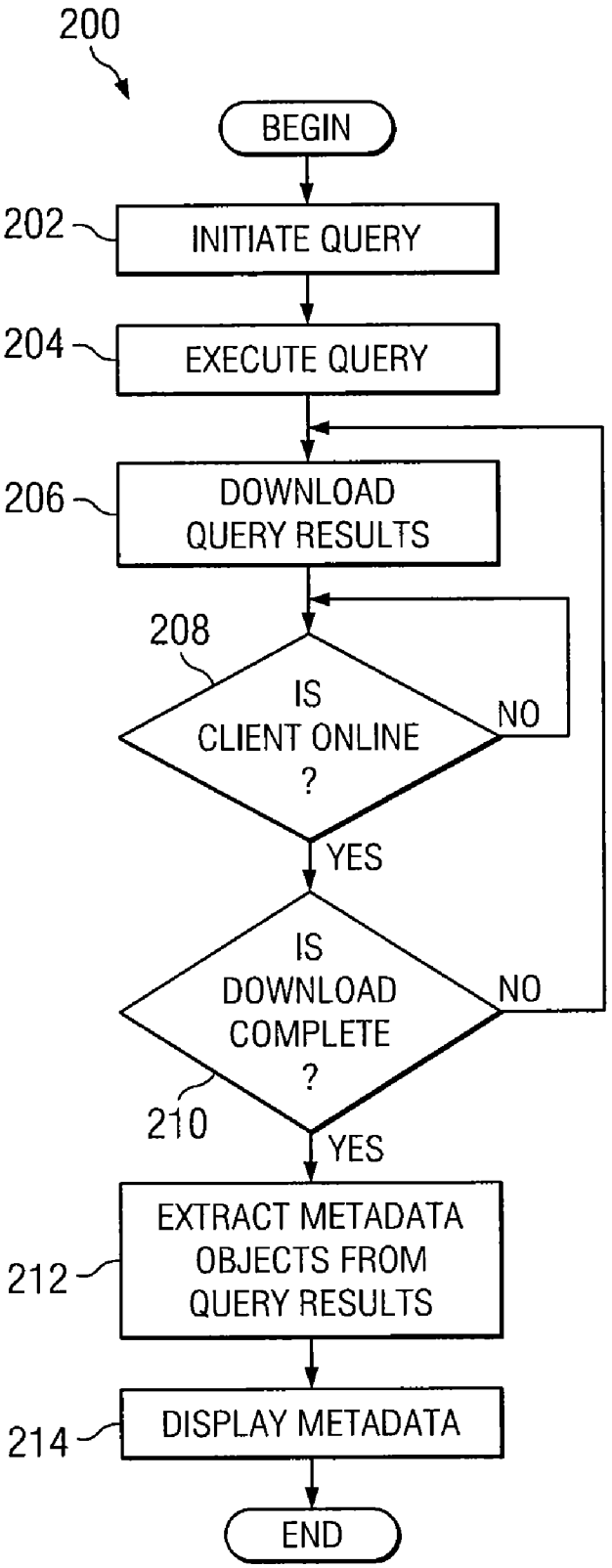

200
BEGIN
202
INITIATE QUERY
204
EXECUTE QUERY
206
DOWNLOAD QUERY RESULTS
208
IS CLIENT ONLINE ?
NO
YES
IS DOWNLOAD COMPLETE ?
NO
210
YES
212
EXTRACT METADATA OBJECTS FROM QUERY RESULTS
214
DISPLAY METADATA
END

FIG. 2

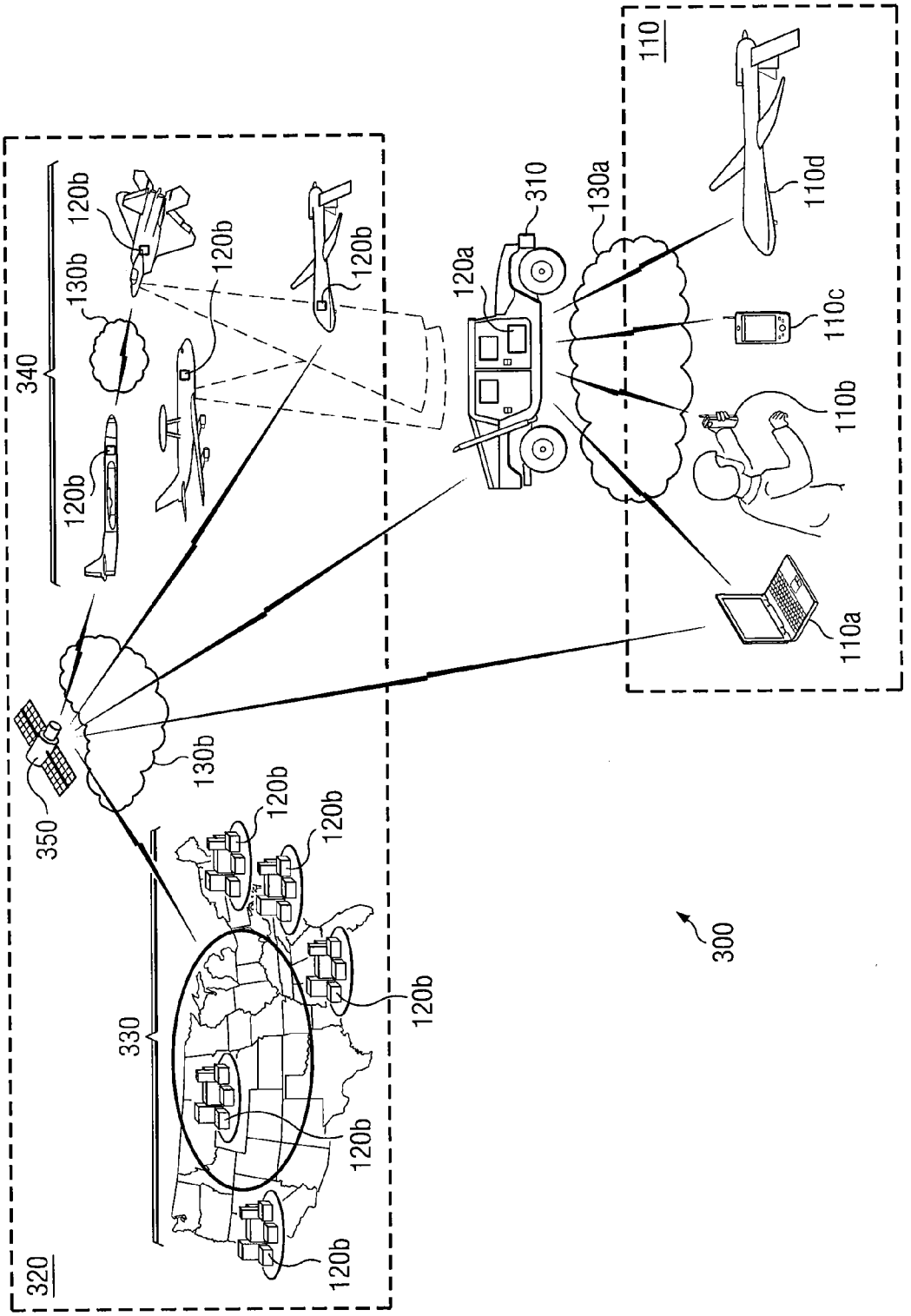

110
110a
110b
110c
110d
120a
120b
130a
130b
130b
310
320
330
340
350
300

FIG. 3

METHOD AND SYSTEM FOR AUTOMATING DATA QUERIES DURING DISCONTINUOUS COMMUNICATIONS

RELATED APPLICATION

[0001] This application claims benefit under 35 U.S.C. § 119(e) of U.S. Provisional Application Ser. No. 61/110,639, entitled "DOCKABLE ENTERPRISE EXTENSION" filed Oct. 3, 2008, by Joey L. Daugherty et al.

TECHNICAL FIELD

[0002] This disclosure generally relates to information systems, and more particularly, to a method and system for automating data queries during discontinuous communications.

BACKGROUND

[0003] A geographical information system (GIS) is a type of computer executable system that enables the correlation and analysis of data based upon geo-spatially related criteria. A typical geographical information system in use today may include a window portion that is adapted for the display of a geographical map. Other forms of data may be overlaid on this map at their respective geographical locations in order to provide for efficient analysis of this data based upon its relative location on the map. Some geographical information systems may be queried according to various filter criteria.

OVERVIEW

[0004] In accordance with one embodiment, a method includes receiving a query request comprising geospatial filter criteria. The query request may be received from a mobile client computing system capable of displaying query results as overlays on a digital map. The digital map may be stored at the mobile client computing system and the query results may be stored at a server. First and second portions of the query results may be wirelessly transmitted from the server to the mobile client computing system. The first and second portions may be transmitted during first and second communication sessions between the mobile client computing system and the server. The first and second communication sessions may occur during respective time intervals temporally separated from each other by a gap interval. The client may be capable of concatenating the transmitted first and second portions of the query results.

[0005] Depending on the specific features implemented, particular embodiments may exhibit some, none, or all of the following advantages. Various embodiments may be capable of automatically resuming a previously interrupted download without necessarily having to restart the download from scratch. Some systems may be capable of processing a query request for a client and/or routing query results intended for a client independent of whether or not the client is online. Some embodiments may use data compression for client/server transmissions, thereby possibly optimizing the use of some tactical networks that may have smaller bandwidth capabilities. Other technical advantages will be readily apparent to one skilled in the art from the following figures, description and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] A more complete understanding of the example embodiments will be apparent from the detailed description taken in conjunction with the accompanying drawings in which:

[0007] FIG. **1** is a block diagram showing several components of one embodiment of an automated data query system;

[0008] FIG. **2** shows a flowchart illustrating a series of actions that may be taken by various embodiments of the system of FIG. **1**; and

[0009] FIG. **3** is a block diagram showing a portion of an automated data query system capable of using the several components of the system of FIG. **1** in a military application.

DETAILED DESCRIPTION

[0010] A particular embodiment of the present disclosure may be described in the context of a military application. Some military units may use electronic devices that are capable of downloading strategic information regarding an area of operation. Such devices may also be capable of overlaying the downloaded information on a digital map display. Various tactical situations, however, may provide little or no time to interface with the device for purposes of inputting query requests or managing the download of query results. In addition, military units may use electronic devices in remote areas and/or during circumstances that permit only limited or intermittent communication with information sources.

[0011] Particular embodiments of the present disclosure may automatically enable the downloading of strategic information by electronic devices in a manner that addresses the above considerations. For example, particular embodiments may automatically initiate queries such that a member of a military unit does not necessarily need to manually input query request parameters. The automated queries may include filters based on strategic areas of operation including, for example, the present locations and/or the future objectives of the military unit using the device. In addition, various embodiments may automatically manage the information downloads such that an interrupted download may be resumed at some later point as is if no interruption had taken place. Some interrupted downloads may resume automatically without necessarily requiring human input. The results returned from automated queries may be automatically updated such that the downloading device may have access to the latest data. Various embodiments of the present disclosure may be best understood by referring to FIGS. **1** through **3** of the drawings, like reference numerals being used for like and corresponding parts of the various drawings.

[0012] FIG. **1** is a block diagram showing several components of one embodiment of a portion of an automated data query system **100**. The illustrated portion of automated data query system **100** generally includes one or more clients **110**. Clients **110** are capable of communicating with one or more servers **120** through one or more networks **130**. As explained further below, various embodiments of system **100** may be capable of performing automated data queries and seamlessly concatenating the query results from multiple download sessions. In some embodiments, the initiation of multiple download sessions may be automated by a particular client **110** or a particular server **120** during timeframes when the client/server communication may be intermittent or interrupted.

[0013] Each client **110** refers to any computing and/or communication device capable of enabling the communication of information to and/or from network(s) **130** or another component of system **100**. For example, client **110** may be a laptop, a handheld device, some other mobile or non-mobile computing device, or a computer system that may be disposed in the console of a vehicle, such as an aircraft, naval vessel, or tank. In other embodiments client **110** is not readily mobile.

Client **110** may be capable of enabling the communication of information (e.g., query request and/or query results) to and from servers **120** through network(s) **130**.

[0014] In various embodiments, each client **110** may include software residing within memory **104** that when executed may be capable of enabling a user to interface with system **100** through client **110**. For example, each client may include a Graphical User Interface **102** (GUI) that enables a user to input data queries and/or view results of data queries. In various embodiments, at least some of the query results may be displayed by client **110** as overlays on a graphical map based at least partially on one or more geospatial parameters of the results. GUI **102** may also provide a user with a status bar showing the progress of a download (e.g., in terms of percentage complete) and/or the strength of a communication signal. In particular embodiments, the GUIs **102** of some clients **110** may be Java enabled and executable using any suitable web browser, such as a Firefox, Internet Explorer, or Opera based web browser; however, any suitable GUI **102** may be used. In particular embodiments, a download manager **106** residing in memory **104** of client **110** may be capable of managing the download of one or more data files **129**, as explained further below. Memory **104** may comprise any suitable volatile or nonvolatile storage and retrieval device or combination of devices. In various embodiments, memory **104** may comprise any combination of storage media. Additionally, all or part of memory **104** may reside locally within client **104** or could reside remotely from and accessible to client **104**.

[0015] In some embodiments, the communication between a particular client **110** and a particular server **120** may be performed internally, such as, for example, via a system bus; or the communication between a particular client **110** and a particular server **120** may be through one or more wireless or wireline networks **130** and/or through one or more other servers **120**. For example, one or more clients **110** may each be capable of communicating one or more requests through network **130***a,* which request(s) may be received and processed, for example, by server **120***a* using download manager **121**.

[0016] Network(s) **130** may comprise any combination of wireless and/or wireline networks capable of supporting communication between network elements and/or between other components of system **100**. For example, network **130***a* and/or network **130***b* may comprise a radio network (e.g., radio frequency (RF), ultra high frequency network (UHF), etc.), a cellular network, a satellite communications network (e.g., SATCOM, INMARSAT, etc.), a data network (e.g., Enhanced Position Location Reporting System (EPLRS)), a public switched telephone network (PSTN), an integrated services digital network (ISDN), a local area network (LAN), a wide area network (WAN), a metropolitan area network (MAN), all or a portion of the global computer network known as the Internet, any combination of the preceding, and/or other communication systems or combination of communication systems at one or more locations.

[0017] In this example, system **100** includes at least two servers **120***a* and **120***b*; however, any number of servers **120** may be used including, for example, a single server **120**. Server(s) **120***a* may include any hardware, software, firmware, or combination thereof capable of enabling communication of information to and/or from network(s) **130** or another component of system **100**. In various embodiments, servers **120***a* may include, for example, one or more directory servers, client servers, file servers, domain name servers, proxy servers, web servers, application servers, computer workstations, data repositories, routers, any combination of the preceding, or any other machine(s) or apparatus capable of enabling communication of information to and/or from network(s) **130** or another component of system **100**. In the illustrated embodiment, server **120***a* includes memory **122**, interface **123**, input/output device **124**, and one or more processors **125**.

[0018] Memory **122** may comprise any suitable volatile or nonvolatile storage and retrieval device or combination of devices. In various embodiments, memory **122** may comprise any combination of storage media. Additionally, all or part of memory **122** may reside locally within server **120***a* or could reside remotely from and accessible to server **120***a*. Download manager **121**, discussed further below, resides within memory **122** of server **120***a*. Download manager **121** may comprise software, firmware, data compilations, and/or a combination thereof

[0019] Interface **123** may comprise any device(s) that may be used (e.g., by a person, or by another device or system) to communicate with server **120***a*. For example, one or more keyboards or a mouse may be considered input interfaces of server **120***a* while monitors and printers may be considered output interfaces of server **120***a*. Input/output device **124** may refer to one or more devices capable of implementing the communication between server **120***a* and one or more other devices (e.g., one or more of clients **110**, servers **120***b,* and/or another information processing system).

[0020] In this example, each server **120***a* is in communication with data storage **126**. Data storage **126** represents one or more databases, computer components, devices, and/or recording media capable of retaining one or more data caches **128** of data files **129**. In the illustrated embodiment, data storage **126** includes at least two data caches **128***a* and **128***b* located external to and accessible by server **126***a;* however, all or a portion of each data cache **128***a* and **128***b* may reside at any suitable location including, for example, at respective databases, at server **120***a,* and/or at some other server **120**. Data storage **126** may comprise a magnetic data storage device (e.g., a diskette or a hard disk drive), an optical disc storage medium (e.g., a Laserdisc), a magneto-optical device (e.g., a MiniDisc), random access memory (RAM), or any other suitable volatile or nonvolatile storage and retrieval device or combination of devices. In a particular embodiment, data storage **126** includes an Oracle database partitioned into one or more data caches **128** capable of retaining data files **129** in the form of metadata, products, and/or maps associated with a particular query. At least some of the data files **129** may contain spatially-related information that may be managed by system **100** using any of a variety of relational database software including, for example, Arc Spatial Database Extension software (ArcSDE) by Environmental Systems Research Institute (ESRI).

[0021] The other illustrated server **120***b* of system **100** may include any hardware, software, firmware, or combination thereof capable of performing all or a portion of a data query and/or communicating the results of such a query to network (s) **130** and/or another component of system **100**. In various embodiments, servers **120***b* may include, for example, one or more directory servers, client servers, file servers, domain name servers, proxy servers, web servers, application servers, computer workstations, data repositories, routers, any combination of the preceding, or any other machine(s) or appara-

tus capable of performing all or a portion of a query and/or communicating the results of such a query to network(s) **130** and/or another component of system **100**. Some servers **120***b* may include a searchable metadata framework. In a particular embodiment, server **120***b* may additionally include structure and functionality substantially similar to that described previously with reference to server **120***a* and/or server **120***a* may additionally include structure and functionality substantially similar to that described above with reference to server **120***b*.

[0022] In operation, system **100** is generally capable of performing data queries and transmitting query results to clients **110** during one or more download sessions. Some data queries may be based at least partially on spatial, temporal, and/or contextual filter criteria regarding one or more geospatial areas of interest. Additional detail regarding the operation of some example embodiments of the present disclosure is described further with reference to FIG. **2**.

[0023] FIG. **2** shows a flowchart **200** illustrating a series of actions that may be taken by various embodiments of system **100** of FIG. **1**. The series of actions generally include initiating a query, executing the query, downloading query results during one or more download sessions, extracting metadata objects from query results, and displaying the metadata.

[0024] In act **202**, a query is initiated. For example, a query may be initiated by generating, transmitting, modifying, and/or receiving a query request. Each query may be initiated at any suitable component of system **100** including, for example, at one or more clients **110** and/or servers **120**. The initiation of a query may sometimes involve determining the location, or an expected location, of a particular client **110** and applying query filters accordingly.

[0025] In some embodiments, all or a portion of the query initiation of act **202** may be performed automatically. For example, system **100** may initiate the query in automatic response to a power-up sequence of the client **110**. As a part of the power-up sequence, client **110** may determine its approximate location and automatically generate or otherwise modify the query filter criteria accordingly. Although some embodiments may generate filter criteria automatically, particular embodiments may provide additional or alternative query filter criteria in response to input received locally at client **110**, such as, for example, in response to user input received via a client **110** interface.

[0026] In some embodiments, the initiation of a query may occur in act **202** during what may be considered as a first communication session between client **110** and one or more servers **120**. For example, a particular server **120** may initiate the query in response to a transmission received directly from client **110** or indirectly from client **110** via or another server **120**. Server **120** may automatically initiate the filter criteria of the query request based on a variety of factors including, for example, the time server **120** received the transmission from client **110**, geospatial information received from client **110**, an estimation of the client's **110** present location, an estimation of the client's **110** future location, a stored query procedure associated with client **110**, filter criteria transmitted by client **110**, and/or any of a variety of other factors.

[0027] The query is executed in act **204**. For example, a query may be executed by searching metadata within one or more databases accessible to one or more servers **120**. The search of metadata may be in accordance with spatial, temporal, and/or contextual filter criteria that, in some embodiments, may have been initiated in act **202**. The execution of a query generally returns one or more query results. In some cases, system **100** may automatically and periodically update the query results of an executed query in anticipation of future transmission to a client **110** that may request information in accordance with the same query filter criteria.

[0028] At least a portion of the query results are downloaded in act **206**. For example, a download may involve transmitting query results between servers **120** and/or from one or more servers **120** to client **110**. Particular embodiments may manage the downloading of information from server **120** to client **110** using download managers **106** and/or **121**.

[0029] In some embodiments, the components of system **100** that may be used to initiate a query in act **202** and/or execute a query in act **204** may not necessarily be the same components or the only components downloading the query results in act **206**. For example, the result(s) of a query initiated at one or more servers **120** in act **202** may be downloaded by a particular client **110** in act **206** and/or the result(s) of a query initiated at one client **110** in act **202** may be downloaded by one or more other clients **110** in act **206**.

[0030] In a particular embodiment, all or a portion of data file(s) **129** stored within data storage **126** and accessible to server **120** may contain at least some of the query results corresponding to a query initiated in act **202**. The requesting client **110** may immediately download all or a portion of these available query results in act **206** if such results are available at server **120**. Various communication disruptions, however, may inhibit or completely prevent clients **110** from downloading all or a portion of any query results immediately available at server **120**. In addition, the data files **129** available at server **120**, if any, may not be completely responsive to all of the information requested by clients **110**. In some embodiments, server **120** may respond to a query request by downloading, in act **206**, at least some of the requested information from an external source including, for example, from one or more other servers **120**. Server **120** may store in storage **126** any information downloaded from an external source. This stored information may be transmitted to the requesting client **110** during one or more download sessions.

[0031] In some embodiments, query results may be transmitted between components of system **100** independent of the online status of a particular client **110** that ultimately downloads the query results in act **206**. For example, one or more queries executed by server(s) **120***b* in act **204** may generate results of a query initiated by a particular client **110** in act **202**. System **100** may select a server **120***a* that is expected to be located nearest to the requesting client **110** during an anticipated download of the query results by the requesting client **110**. The selected server **120***a* may execute a download of the query results from server(s) **120***b* in act **206**. Sever **120***a* may then store the downloaded data files **129** in data cache **128** for later retrieval by the requesting client **110**. Routing query results from server(s) **120***b* to client **110** through a server **120***a* in this manner may enhance communication efficiency in some cases where the communication bandwidth through network **130***b* is greater than the available bandwidth of client/server network **103***a*.

[0032] Any of a variety of other techniques may be used to further enhance the communication efficiency between components of system **100** during downloads performed in act **206**. For example, the server-side download manager **121** may be capable of digitally compressing at least some of the data files **129** downloaded by clients **110** and download manager **106** may be capable of decompressing data files **129**

during or after the download process is complete. Any suitable compression/decompression algorithm(s) may be used including, for example, GNU zip (GZIP) compression. Transmitting digitally compressed files between clients **110** and servers **120** in this manner may not only increase the communication efficiency between these components, but may also enhance security by minimizing the possibility that third parties will be able to effectively interpret any information intercepted while in transit.

[0033] System **100** may be capable of enabling the download of query results by client **110** in act **206** even during timeframes when the communication between client **110** and other components of system **100** may be intermittent or interrupted. In some embodiments, the seamless concatenation of query results downloaded during one or more download sessions may be at least partially managed by download managers **106** and **121** residing at server **120***a* and client **110**, respectively. For example, download managers **106** and/or **121** may monitor the progress of a download by client **110** of one or more data files **129** stored in data cache **128** of server **120***a*. If a download session is interrupted before 100% of the data file(s) **129** have been successfully downloaded by client **110**, download managers **106** and/or **121** may store information (e.g., within memories **104** and/or **122**, respectively) that when later retrieved enables client **110** to automatically resume the download precisely where it had left off In various embodiments, download mangers **106** and/or **121** may perform the management of downloads in an automated or semi-automated manner. In some embodiments, for example, download managers **106** and/or **121** may automatically pause the execution of a download in response to a detection that the receiving client **110** is no longer online; and download managers **106** and/or **121** may automatically enable the seamless continuation of a paused download in response to a detection that the receiving client **110** has resumed an online status as explained further with reference to act **208**.

[0034] A determination is made in act **208** regarding whether the client **110** is online with respect to the particular server **120**. As used herein, a first component is "online" with respect to a second component if the first component is ready and able to receive communications from the second component. In a particular embodiment, the act of determining whether client **110** is online with respect to server **120** may include, for example, transmitting a ping signal from server **120** to client **110** and monitoring at server **120** for an expected response. In some alternative embodiments, server **120** may determine whether client **110** is online by continually or periodically monitoring for one or more transmitted signals from client **110** without necessarily transmitting a ping signal to client **110**. At least partially in response to a determination that client **110** is online, server **120** may transmit data packets containing query results for client **110** to download as described previously with reference to act **206**.

[0035] If a determination is made in act **208** that client **110** is not online, however, server **120** may stop transmitting data packets to client **110** and may terminate a download session or, in some alterative embodiments, server **120** may pause and maintain a download session until another determination may be made that client **110** has resumed an online status. Any of a variety of factors may cause or contribute to an interrupted communication between client **110** and server **120**, which interruption may result in client **110** having an offline status. For example, client **110** may be turned off, incapable of transmitting a signal that is detectable by server **120**, outside the radiation pattern of a signal transmitted by server **120**, or otherwise not capable of detecting a transmitting signal from server **120**. At some point, however, client **110** may resume an online status with respect to server **120**.

[0036] Upon a determination, in act **208**, that client **110** is once again online with respect to server **120**, server **120** may resume a paused download session at a point where it had left off or, in some alternative embodiments, server **120** may initiate a new download session and transmit a data packet that client **110** may have not yet downloaded, or that client **110** may have only partially downloaded, in a previous download session.

[0037] In act **210**, a determination is made regarding whether the download is complete. For example, download managers **106** and/or **121** may continually monitor the progress of a download of one or more query results, which download may include multiple download sessions. The download sessions may be temporally separated from each other by one or more time intervals during which time client **110** may not necessarily be online with respect to server **120**.

[0038] If it is determined that the query results are completely downloaded, client **110** may extract metadata objects from the query results in act **212** and display the metadata objects as information overlaid on a map in act **214**. For example, client **110** may store the query results downloaded in act **206** within memory **104** as data file(s) **108**. At least some of the stored data file(s) **108** may include spatial information, which when extracted may be represented by GUI **102** as objects overlaying a display map. In some embodiments, client **110** may store multiple maps within memory **104** as data file(s) **108** and client **110** may include software configured to display the map portion of the data file(s) **108**, thereby enabling a variety of geospatial backdrops that may be used to display any metadata extracted from the query results in act **212**. By retrieving data file(s) **108** and/or maps stored within memory **104**, client **110** may thus be capable of spatially displaying filtered information to a user regarding one or more geospatial areas of interest regardless of the online status of client **110** with respect to other components of system **100**.

[0039] Some or all of the example acts of flowchart **200** associated with initiating a query, executing the query, downloading query results during one or more download sessions, extracting metadata objects from query results, and displaying the metadata may be implemented automatically by systems **100** without a user necessarily having to manually input query request parameters, reestablish a communication session, and/or provide any other instruction. In particular embodiments, some or all of the example acts of flowchart **200** may be initiated in response to a power-up sequence of client **110**.

[0040] Additional detail regarding the operation of one embodiment of system **100** may be explained in the context of a military application that involves automatically querying and seamlessly communicating strategic information for mobile clients **110** in use by military units, as explained further with reference to FIG. **3**.

[0041] FIG. **3** is a block diagram showing a portion of an automated data query system **300** capable of using the several components of the system **100** of FIG. **1** in a military application. In this example, system **300** generally includes multiple mobile clients **110***a*, **110***b*, **110***c*, and **110***d* capable of downloading information from one or more servers **120***a* at a local site **310** and/or from a network enterprise **320**. The

server **120***a* at local site **310** is generally capable of storing query results and routing query results from network enterprise **320** to clients **110**. Network enterprise **320** generally includes one or more servers **120***b* located at stationary information centers **330**. Each server **120***b* of the stationary information centers **330** is connected through network(s) **130** to one or more servers **120***b* disposed in mobile routers **340**. The system **300** illustrated in FIG. **3** may operate in a tactical environment that may sometimes permit only intermittent communication between the components of system **300** (e.g., client/server, client-to-client, and/or server-to-server communications).

[0042] In this example, clients **110***a*, **110***b*, **110***c*, and **110***d* are a laptop computer, a cell phone, a handheld computer, and an unmanned drone, respectively. Each client **110** is capable of communicating query requests and downloading query results for any of a variety of military applications. For example, a solider may wish to query any of the following types of information: the location and composition of enemy units and/or friendly units relative to one or more battlefield maps stored on client **110**; the location and nature of civilian installations in a particular area of interest; and/or some other type of information regarding a specific area of operation. In some embodiments, the solider may input queries by typing specific filter criteria using an interface of client **110**, such as, for example, a keyboard or a keypad.

[0043] The soldier may alternatively input or otherwise modify a query by pressing one or more functional buttons of client **110**. For example, the press of a power button on client **110** may trigger a power-up sequence that includes the transmission of a request for data. System **300** may respond to this request by executing or otherwise modifying a preconfigured query procedure in accordance with an approximate location or an estimated future location of the powered-on client **110** as determined by system **300**, and/or system **300** may respond by commencing or resuming the downloading of query results by the powered-on client **110**. Some functional buttons may be preconfigured or programmable such that their selection transmits query requests having particularized filters. For example, some functional buttons may request specific information regarding enemies and/or allies that may be overlaid on a battlefield map. The transmission of query requests and/or the downloading of query results by client **110** through the use of functional buttons may minimize the time the soldier spends interfacing with client **110**, which may provide a tactical advantage in some situations.

[0044] In this example, local site **310** is a military vehicle that is positioned proximate to clients **110***a*, **110***b*, **110***c*, and **110***d* and that contains one or more server(s) **120***a* capable of communicating wirelessly with clients **110***a*, **110***b*, **110***c*, and **110***d* and with the various components of network enterprise **320**. Local site **310** may respond to query requests from clients **110** by transmitting any query results already available to local site **310** upon detection that the requesting client **110** is online. In addition, local site **310** may respond to a query request by retrieving at least some of the requested information from an external source including, for example, network enterprise **320** or from the server(s) **120***a* of another local site **310**.

[0045] In this example, network enterprise **320** includes one or more stationary information centers **330** connected through one or more networks **130** to one or more mobile routers **340**. Stationary information centers **330** generally refer to any of a variety of searchable information repositories residing at military bases. One example of a stationary information center **330** may include multiple servers **120***b* residing at the United States Strategic Air Command Base (SAC).

[0046] Each mobile router **340** generally refers to any suitable military vehicle capable of transmitting information to particular communication zones that may encompass local site **310** and/or clients **110**. Some mobile routers **340** may also include one or more servers **120***b* capable of executing data queries and/or storing query results. In the illustrated example, each mobile router **340** is a military aircraft (e.g., a Lockhead U-2); however, any suitable land-based or water-based mobile router **340** may be used.

[0047] Network enterprise **320** also includes network(s) **130** capable of communicatively coupling the various components of network enterprise **320** to each other and to local site **310**. The network(s) **130** illustrated in FIG. **3** include one or more satellites **350**, each of which may enable communication between each stationary information center **330** and each mobile router **340**. In addition, each satellite **350** of network(s) **130** may be capable of enabling direct communication between a particular client **110** and a server **120***b* of network enterprise **320** without necessarily routing the communication through local site **310**.

[0048] In the context of a military application, a solider may input a request using client **110** and then the soldier may be exposed to a combat situation during which time communication between client **110** and local site **310** may become disrupted. Thus, client **110** may not necessarily be online with respect to local site **310** during all or a potion of the time interval lasting from the moment client **110** transmitted the request to the moment client **110** determined that all or a portion of the requested information is available at local site **310**. Regardless of whether or not client **110** remains online, local site **310** may store any query results received from network enterprise **320** and/or another local site **310** in preparation for subsequent downloading by client **110** during one or more time intervals when **110** is online with respect to local site **310**. In addition, local site **310** may periodically and/or automatically determine whether any data that local site **310** may have downloaded from an external source has been subsequently updated or otherwise modified by the external source; and local site **310** may modify any corresponding data files **129** stored in data storage **126** accordingly.

[0049] If client **110** does not maintain an online status with respect to local site **310** after transmitting a request, at some point client **110** may reestablish communication with local site **310**, determine that local site **310** has some or all of the requested information, and then download all or a portion of the available information accordingly. In particular embodiments, client **110** may determine that local site **310** has modified all or a portion of a data file **129** previously downloaded and stored by client **110**; and in response, client **110** may download all or a portion of the modified data file **129** and update the client's **110** stored data file(s) **108** accordingly. As explained previously with reference to FIGS. **1** and **2**, if a download is interrupted, client **110** may later resume the download as if the interruption had not occurred.

[0050] Thus, system **300** may provide any of a variety of advantages in the context of a military application. For example, a solider using client **110** in a time critical situation will not necessarily have to restart an interrupted download from scratch. In addition, system **300** may perform a bulk of the query processing and data transmission independent of whether or not client **110** is online with respect to servers **120**

that may be located at local site **310** or network enterprise **320**. The downloading of information by client **110** from local site **310** may be independent of whether or not local site **310** is online with respect to servers **120** external to local site **310**. Particular embodiments using data compression for all or some of the client/server transmissions may be advantageous for the portions of network(s) **130** that may have lower bandwidth capabilities. For example, some tactical "soda straw" networks **130** enabling communication between clients **110** and local site **310** may average as little as five kilobits per second.

[0051] It should also be noted that where a flowchart is used to demonstrate various aspects of particular embodiments, it should not be construed to be limited to any particular logic flow or logic implementation. The described logic may be partitioned into different logic blocks (e.g., programs, modules, functions, or subroutines) without changing the overall results. Often, logic elements may be added, modified, omitted, performed in a different order, or implemented using different logic constructs (e.g., logic gates, looping primitives, conditional logic, and other logic constructs).

[0052] Computer program logic implementing all or part of the functionality where described herein may be embodied in various forms, including a source code form, a computer executable form, and various intermediate forms (e.g., forms generated by an assembler, compiler, linker, or locator). Source code may include a series of computer program instructions implemented in any of various programming languages (e.g., an object code, an assembly language, or a high-level language such as Fortran, C, C++, JAVA, JavaScript, or HTML) for use with various operating systems or operating environments, including future operating systems or environments. The source code may define and use various data structures and communication messages. The source code may be in a computer executable form (e.g., via an interpreter), or the source code may be converted (e.g., via a translator, assembler, or compiler) into a computer executable form.

[0053] The computer program may be fixed in any form (e.g., source code form, computer executable form, or an intermediate form) either permanently or transitorily in a tangible storage medium, such as a semiconductor memory device (e.g., a RAM, ROM, PROM, EEPROM, or Flash-Programmable RAM), a magnetic memory device (e.g., a diskette or fixed disk), an optical memory device (e.g., a CD-ROM or DVD-ROM), a PC card (e.g., PCMCIA card), or other memory device. The computer program may be fixed in any form in a signal that is transmittable to a computer using any of various communication technologies, including, but in no way limited to, analog technologies, digital technologies, optical technologies, wireless technologies (e.g., Bluetooth), networking technologies, and inter-networking technologies. The computer program may be distributed in any form as a removable storage medium with accompanying printed or electronic documentation (e.g., shrink wrapped software), preloaded with a computer system (e.g., on system ROM or fixed disk), or distributed from a server or electronic bulletin board over the communication system (e.g., the Internet or World Wide Web). In a particular embodiment, all or a portion of the various software applications used to implement at least some of the acts of system **100** may be embodied in any of a variety of other suitable computer-readable medium, such as, for example, removable media.

[0054] Although the present disclosure has been described with several embodiments, a myriad of changes, variations, alterations, transformations, and modifications may be suggested to one skilled in the art, and it is intended that the present disclosure encompass such changes, variations, alterations, transformations, and modifications as fall within the scope of the appended claims.

What is claimed is:

1. A computer-implemented system for executing queries, the system comprising:

one or more servers each operable to:

process at least a respective portion of a query request, the query request comprising geospatial filter criteria; and

generate one or more respective query results corresponding to the query request;

a local server coupled to each of the one or more servers through a first wireless network and operable to receive and store each of the one or more respective query results; and

a mobile client computer system communicatively coupled to the server through a second wireless network, the mobile client computing system operable to:

transmit the query request through the second wireless network to the local server during a first communication session between the mobile client computing system and the local server;

receive first and second portions of the one or more respective query results, the first portion received during a second communication session between the mobile client computing system and the local server, the second portion received during a third communication session between the mobile client computing system and the local server, the second and third communication sessions occurring during respective time intervals temporally separated from each other by a gap interval, the third communication session initiated automatically by the mobile client computing system or the local server;

concatenate the received first and second portions of the one or more respective query results;

extract metadata objects from the concatenated first and second portions of the one or more query results;

render a map from data stored at the mobile client computing system, the data different from the received first and second potions of the one or more respective query results; and

display as overlays on a map the extracted metadata objects, the map rendered by a display screen of the mobile client computing system from data stored at the mobile client computing system independent of the received first and second portions of the one or more query results.

2. The computer-implemented system of claim **1**, wherein a second server of the one or more servers is disposed in the console of a vehicle selected from the group consisting of:

a land-based vehicle;

a water-based vehicle; and

an aircraft.

3. The computer-implemented system of claim **1**, wherein the mobile client computing system is further operable to automatically initiate the third session with the local server at least partially in response to a power-up sequence of the mobile client computing system.

4. The computer-implemented system of claim **1**, wherein the mobile client computing system comprises an interface comprising one or more buttons each associated with a respective preconfigured query procedure.

5. A method comprising:

wirelessly transmitting a query request comprising geospatial filter criteria, the query request transmitted during a first wireless communication session between a mobile client computing system and a server;

wirelessly receiving at the mobile client computing system first and second portions of one or more query results corresponding to the query request, the first portion received during a second communication session between the mobile client computing system and the server, the second portion received during a third communication session between the mobile client computing system and the server, the second and third communication sessions occurring during respective time intervals temporally separated from each other by a gap interval, the third communication session initiated automatically by the mobile client computing system or the server;

concatenating by the client the received first and second portions of the one or more query results corresponding to the query request;

extracting metadata objects from the concatenated first and second portions of the one or more query results corresponding to the query request;

rendering a map from data stored at the mobile client computing system, the data different from the received first and second portions of the one or more query results; and

displaying as overlays on the map the extracted metadata objects.

6. The method of claim **5**, further comprising automatically initiating the third session at least partially in response to a detection by the server that the mobile client computing system is ready to receive transmissions from the server.

7. The method of claim **5**, further comprising automatically initiating the third session by the mobile client computing system at least partially in response to a power-up sequence of the mobile client computing system.

8. The method of claim **5**, wherein the first and second communication sessions occur during respective time intervals separated by a second gap interval.

9. The method of claim **5**, wherein the query request is transmitted automatically in response to a power-up sequence of the mobile client computing system.

10. The method of claim **5**, further comprising inputting the query request at the mobile client computing system using one or more buttons each associated with a respective preconfigured query procedure.

11. The method of claim **5**, further generating the query results by executing the query request using one or more databases accessible to the server

12. The method of claim **5**, further comprising downloading at the server the one or more query results corresponding to the query request, the one or more query results downloaded by the server from one or more other servers capable of executing the query request using one or more databases accessible to the one or more other servers.

13. The method of claim **5**, further comprising persistently storing the one or more query results at the server and at the mobile client computing system.

14. A method comprising:

receiving a query request comprising geospatial filter criteria;

storing at a server one or more query results corresponding to the query request; and

wirelessly transmitting first and second portions of the one or more query results from the server to a mobile client computing system, the first portion received during a first communication session between the mobile client computing system and the server, the second portion received during a second communication session between the mobile client computing system and the server, the first and second communication sessions occurring during respective time intervals temporally separated from each other by a gap interval, the mobile client computing system capable of concatenating the transmitted first and second portions.

15. The method of claim **14**, wherein the first and second portions of the one or more query results are each transmitted automatically in response to respective detections by the server that the mobile client computing system is ready to receive transmissions from the server.

16. The method of claim **14**, further comprising downloading at the server the one or more query results corresponding to the query request, the one or more query results downloaded by the server from one or more other servers capable of executing the query request.

17. The method of claim **14**, further comprising:

determining the approximate location of the mobile client computing system; and

filtering the one or more query results based at least partially on the determination of the approximate location of the mobile client computing system.

18. The method of claim **14**, further comprising storing at the server the one or more query results corresponding to the query request.

19. The method of claim **14**, wherein the first and second portions of the one or more query results are each transmitted automatically in response to a detection that the mobile client computing system is ready to receive transmissions from the server.

20. The method of claim **14**, further comprising automatically initiating, by the mobile client computing system or by the server, the second communication session.

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